

GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF RESEARCH ADMINISTRATION

RESEARCH PROJECT INITIATION

Date: 24 July 1973

Project Title: "Radiological Health Specialists Training Program"

Project No: E-26-508

Principal Investigator Dr. Francis Chambers, Jr.

Sponsor: Environmental Protection Agency

Agreement Period: From September 1, 1973 Until August 31, 1974

Type Agreement: Grant No. T-900284

Amount: \$38,174

Reports Required: Interim submitted with renewal application.
Final upon termination.

Sponsor Contact Person (s):

Dr. R. J. Augustine
Environmental Protection Agency
401 M Street, S.W.
Washington, D. C. 20460

Assigned to: Nuclear Engineering

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GEORGIA INSTITUTE OF TECHNOLOGY
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RESEARCH PROJECT TERMINATION

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*Inventory submitted
2 Feb. '76 per EPA ITY.
of 8 Oct '75*

Date: February 4, 1976 *AMH*

Project Title: Radiological Health Specialists Training Program

Project No: E-26-508

Principal Investigator: Dr. C. J. Roberts

Sponsor: Environmental Protection Agency

Effective Termination Date: 8/31/75

Clearance of Accounting Charges: 8/31/75

Grant/Contract Closeout Actions Remaining: Expenditures Report (PHH)
Inventions Report (JWW)

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E-26-508

E-26-508

GEORGIA INSTITUTE OF TECHNOLOGY
ATLANTA, GEORGIA 30332

SCHOOL OF
NUCLEAR ENGINEERING

September 18, 1975

Dr. R. J. Augustine
Training Grants Project Officer
Office of Radiation Programs (AW-558)
Environmental Protection Agency
Washington, D. C. 20460

Ref: EPA Grant No. T-900284
GIT Project No. E-26-508

Dear Bob:

You may recall that in mid-August we discussed by telephone the preparation of the final report on our Radiological Health Specialist Training Program. I have delayed sending the report to you while awaiting instruction from your Grants Administration Division. Having heard nothing I now enclose 3 copies of the report for your review.

Please let me know if additional information is needed. Obviously, this grant has been extremely important to Tech in making possible the development and maintenance of a rad health training program. We are very grateful for the support over an extended period of time and will sorely miss it.

Best personal regards to you.

Sincerely,

C. J. Roberts
Professor of Nuclear
Engineering

CJR:sd

cc
Contract Administration
L. E. Weaver

Final Report
to the
U.S. Environmental Protection Agency
on the
Radiological Health Specialist Training Program
Georgia Institute of Technology
during the period
September 1, 1970 thru August 31, 1975
Grant No. T-900284

I. Introduction

A Radiological Health Specialist Training Program (RHSTP) existed at the Georgia Institute of Technology over a period of approximately 15 years. This program was funded originally by the US PHS through its Bureau of Radiological Health and then during the last several years by the Environmental Protection Agency. The last project period was from September 1, 1970 thru August 31, 1975. This report is the final one for this last five-year period, but in it reference is made to the program's development over the more extended period.

II. Program Development and Curriculum

During the period of five academic years from September, 1970 to August, 1975 the radiological health program at Georgia Tech has evolved and grown in an orderly manner and in keeping with the national needs. In this time, concern about the quality of the environment in the U.S. resulted in the establishment of new standards and regulations at all levels of government, and manpower requirements grew accordingly. Simultaneously, the nuclear power industry came of age and the radiological aspects of environmental protection assumed greater importance. Also, this period saw an increased recognition of the potential hazards from non-ionizing radiation sources. Adjustments in our academic program content were made in response to these influences.

Comparing typical programs of study in radiological health at the M.S. level one notes the following similarities and changes from 1969-70 to 1974-75:

- a) the basic courses in radiation physics, radiation biology, health physics, and dosimetry remain as they were with only the expected modifications in keeping with technical developments.
- b) the single course on environmental radiation surveillance has expanded and spun off additional courses on environmental impact and its assessment and on background and low-level environmental monitoring.
- c) two additional courses on applied health physics have been added. These emphasize the calculation and measurement of

of radiation dose from occupational exposure and environmental contamination.

- d) a course in non-ionizing radiation protection is offered routinely.
- e) no effort is made to teach public health administration and organization.

During this period of change, the radiological health program has become consolidated almost completely within the School of Nuclear Engineering. This has resulted in better coordination and more effective recruiting. At the M.S. level enrollment doubled and the Ph.D. activity has tripled. As of August, 1975, among those enrolled are thirteen M.S. candidates and ten Ph.D. candidates who are identified with the radiological health program. As an example of our current programming, a typical 4 quarter, non-thesis curriculum in radiological health leading to the degree of Master of Applied Nuclear Science is attached as Appendix A.

III. Program Staff

During the five year span of the Radiological Health Specialist Training Program there was one significant loss of staff, but several additions which resulted in an overall strengthening of the program. Professor F. W. Chambers , Jr. had been Program Director since 1966 and had been actively involved as a teacher, research adviser and counselor since his appointment to the Georgia Tech Faculty in September, 1964. In December, 1973, he retired leaving a large void to be filled.

Upon Professor Chamber's retirement, the administrative duties of the Program Director were assumed by Dr. Carlyle J. Roberts, Professor of Nuclear Engineering. Dr. Roberts had been Director of the RHSTP prior to 1966 and had been involved in the teaching aspects of the program since its inception.

Professor Chambers' interests were in radiation dosimetry and medical health physics. To fill the program needs for teaching competence in these areas we recruited Dr. Patton H. McGinley, a radiation physicist at Emory University and the Emory University Clinic. Dr. McGinley has a joint appointment at Emory and Georgia Tech which enables him to provide an effective bridge to the medical environment for radiological health students wishing to emphasize the medical aspects.

In 1972, the program was strengthened when Dr. Karl Z. Morgan, former Director of the Health Physics Division of Oak Ridge National Laboratory, joined the staff. Dr. Morgan is an internationally recognized expert in radiological health. His addition to the teaching staff provided our

students with a unique opportunity to learn directly from a man who has profoundly influenced the development of radiological health as a profession.

The environmental aspects of the RHSTP were augmented in September, 1974, when Dr. Bernd Kahn joined Tech's faculty as Professor of Nuclear Engineering and Director of the Environmental Resources Center. Dr. Kahn for many years had been with EPA (formerly with PHS) and is widely recognized for his outstanding work in environmental radioactivity measurement. He taught two M.S.-level courses in this and related areas during the 1974-75 year. The program also has benefitted from the presence on campus as Professor of Nuclear Engineering and Director of the Office of Interdisciplinary Programs of Dr. Melvin W. Carter, formerly the Director of the EPA Las Vegas Laboratory.

Other program faculty remain with no losses and little rearrangement of teaching assignments previously described. In addition to those specifically named above, the faculty of the RHSTP include Dr. G. G. Eichholz, (Nuclear Engineering), Dr. Robert H. Fetner, (Biology), Dr. Don S. Harmer, (Physics and Nuclear Engineering), Dr. Henry M. Neumann, (Chemistry).

This group of teachers with supporting faculty for computing and instrumentation offer a radiological health program which, in our judgment, represents an appropriate balance among the variety of specialties required to solve today's problems. The RHSTP grant has contributed to the long-term stability of the program and made it possible to assemble this excellent faculty. Whether this resource will dissipate in the absence of continued federal support remains to be seen.

IV. Trainees

Since the current project was initiated in September, 1970 the number of trainees completing the M.S. program each year has been as follows:

1970-71	-	4
1971-72	-	4
1972-73	-	6
1973-74	-	4
1974-75	-	4

The individuals who received traineeships during the past two years are listed below. The period of the training support is given in parentheses as well as their present occupation.

Trainees: September 1973-September 1974

John E. Weaver III (6/74-9/74) completed M.S. in August, 1975, and is continuing Ph.D. studies at Georgia Tech in radiological health field.

Kenneth G. Turnage (6/74-9/74) completed M.S. in June 1975. Now employed by Oak Ridge National Laboratory in reactor development.

Mark S. Robinson (7/73-9/74) completed M.S. in June 1974, additional graduate work during summer, 1974. Now employed by Radiological Hygiene Branch, TVA, Muscle Shoals, Alabama.

Raymond L. Clark (9/73-9/74, tuition only) completed M.S. in September, 1974. Employed by US Environmental Protection Agency, Washington, D. C.

Richard A. Zellmer (9/73-9/74, tuition only) completed M.S. in September, 1974. Employed by Abbott Laboratories, North Chicago, Illinois as a radio-pharmaceutical health physicist.

Holger E. StJohn (3/73-6/74) completed M.S. in March, 1974, and is continuing Ph.D. studies at Georgia Tech.

September 1974-August 1975

Robert J. Rodriquez (9/74-6/75) completed M.S. in June, 1975. Now employed as health physicist by Union Carbide at Oak Ridge Gaseous Diffusion Plant.

Glenn L. Murphy (9/74-8/75) completed M.S. in August, 1975. Has accepted position as Radiological Safety Officer at the University of Georgia, Athens, Georgia.

James R. Goodgame, III (1/75-8/75) currently pursuing studies in radiological health at Ph.D. level.

Thus, the two-year extension of this program without new funding from September, 1973, has made possible the support of nine additional trainees. Three of these are continuing work at the Ph.D. level and the other six are employed in the field of radiological health.

V. Program Funding

According to records of the Program Director, the support provided for the RHSTP during the five year period 9/1/70 - 8/31/75 was as follows:

1970-71	\$57,670	(from BRH, US PHS)
1971-72	57,410	
1972-73	50,656	
1973-74	38,174	
1974-75	0	

During the final year beginning September 1, 1974 the funds available consisted of the residue from the 1973-74 grant of \$38,174 plus unobligated funds in the amount of \$1,970 from 1970-72 and \$10,808 from 1972-73.

The final financial report will show that essentially all the funds granted for the RHSTP were expended (residue less than \$1,000). Approximately one-half of the total expenditure was directly for student support (stipend, tuition and fees) and the balance also supported students, but indirectly through support of faculty as well as materials and supplies used in radiological health courses.

Two major pieces of equipment (costing more than \$200 each) were purchased with grant funds. These were the following:

- 1) Victoreen model 2800 TLD reader - \$3,340
- 2) NMC model PC-4 proportional counter - \$2057

Both instruments have become rather common in applied radiation protection work and no comparable instruments were available in the School of Nuclear Engineering. The TLD reader is used in at least three laboratory

courses and by graduate students doing special projects and thesis research.

The proportional counter is the only internal flow counter in the department and, like the TLD system, is used both in formal laboratory training and individual student research.

VI. Program Impact

In reviewing the period of approximately fifteen years during which the RHSTP has been in existence at Georgia Tech the importance of this additional support is apparent. In the early years it was necessary to support classroom teaching in rad health subjects because the numbers of enrolled students did not otherwise justify the cost. Because of the relatively scarce job opportunities at that time it was difficult to recruit students without providing at least partial support. Also since the curricula and individual courses were just being developed, a considerable manpower effort was required outside the classroom and laboratory. With the support of the BRH, USPHS, it was possible to provide the faculty time and to recruit students. As a result when developments in the nuclear power field in the late 1960's caused an increased demand for professional radiation health specialists, the educational facilities were prepared.

In the past five years during which support for the program was shifted from PHS to EPA the funding has made it possible to improve the quality of this now well established program and to support students on the bases of need rather than as a recruiting incentive.

Looking toward the immediate future the impact of the grant termination will be strongly negative. The timing of this termination, relative to the general economic climate in the U.S., the financial condition of the State of Georgia and, specifically, the Georgia Tech budget, is most unfortunate. The demand for radiological health personnel is at an all-time peak, enrollment is up and instructional budgets have been cut. This combination of circumstances will make it difficult to compensate for the loss of grant funds. In the next several years it is inevitable that some qualified

students will not have an opportunity to pursue careers as radiological physicists. There will be fewer opportunities for faculty to attend scientific meetings and this will adversely effect the quality of teaching. Instructional and research materials will be in very short supply. There will be almost no possibility to up-grade instrumentation which becomes obsolete at an alarming rate. Looking 3-4 years ahead one must be more optimistic about obtaining resources sufficient to maintain a viable program. However, this requires a certain amount of faith and causes lingering anxiety which could be dispelled by a new program of support for radiological health. It would seem that the need for trained experts in this field would warrant a relatively modest expenditure to insure a high quality supply.

Despite this concern about funding in the immediate future, it is recognized that a sound Radiation Health Specialist Training Program has been established and that the success of this effort has been due in large part to the financial support of the U.S. Public Health Service and Environmental Protection Agency. The assistance of those agencies and, particularly, the individuals who represented them over a decade and a half, is deeply appreciated by the RHSTP staff of Georgia Tech.

APPENDIX A

GEORGIA INSTITUTE OF TECHNOLOGY SCHOOL OF NUCLEAR ENGINEERING MASTER OF APPLIED NUCLEAR SCIENCE DEGREE (NON-THESIS PROGRAM)

Typical Curriculum in Radiological Health

Fall Quarter

Phys	6011	Principles of Nuclear Physics (or Chem 6610, Nuclear Chemistry)	4-0-4
NE	4115	Digital Computers I	2-0-1
NE	6110	Radiation Detection I	2-6-4
NE	6401	Radiological Health Physics	3-0-3
NE	8001	Seminar	1-0-0

Electives: Biol 3333, Math 4582, NE 6101, 6770, Phys 4211-2

Winter Quarter

Chem	4701	Chemistry of Nuclear Technology	3-3-4
NE	4440	Effects of Nonionizing Radiation	3-0-3
NE	6251	Fundamentals of Nuclear Engineering	3-0-3
NE	6410	Radiation Dosimetry	3-0-3
NE	8002	Seminar	1-0-0

Electives: Biol 3334, Chem 6612, NE 6125, 6413, 6601

Spring Quarter

Biol	6730	Biological Effects of Radiation	3-3-4
NE	6405	Health Physics Practice	1-6-3
NE	6411	Applied Radiation Physics	2-3-3*
NE	6783	Environmental Surveillance and Radioactive Waste Disposal	3-3-4
NE	8003	Seminar	1-0-0

Electives: Chem 6621, ChE 6610, NE 6111, 6770, 8503

Summer Quarter

NE	6429	Particle Accelerators	3-0-3
NE	6430	Radiation Protection in Nuclear Facilities	2-3-3
NE	6442	Applied Health Physics Laboratory	2-3-3
NE	6643	Environmental Impact of Nuclear Power	3-0-3

Electives: Chem 6622, NE 6113, 6126, 6235, 8504

NOTES:

1. Students with an undergraduate background in health physics will choose a Fall quarter program quite unlike the typical example shown above.
2. If already familiar with digital computer programming, the student should omit NE 4115.
3. All students are encouraged to elect 6 or more credit hours of special problem work (NE 8503-4) on a topic related to their professional interests.
4. Those who wish to emphasize medical health physics should elect NE 6411 and 6429. It is probable that arrangements can be made for them to work on a special problem in a hospital environment.

* If enrolled in NE 6411, students are advised to enroll in NE 6641 (3-0-3) rather than NE 6783.